

# Surface Temperature Sensor

## (Order Code STS-BTA)



The Surface Temperature Sensor is designed for use in situations in which low thermal mass or flexibility is required. Special features include an exposed thermistor that results in an extremely rapid response time.

Typical uses for the Surface Temperature Sensor include the following:

- Skin temperature measurements
- Human respiration studies
- Specific heat experiments
- Heat transfer experiments
- Friction and energy studies

**Note:** Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

### Compatible Software and Interfaces

See [www.vernier.com/manuals/sts-bta](http://www.vernier.com/manuals/sts-bta) for a list of interfaces and software compatible with the Surface Temperature Sensor.

### Getting Started

1. Plug the sensor into the interface (LabQuest 3, LabQuest Mini, etc.).
2. Connect the interface to your device.
  - If using USB, connect to the USB port on your computer.
  - If using Bluetooth® wireless technology, click your interface type and then select your device.
3. Prepare for data collection:
  - Vernier Graphical Analysis®: Launch the app, if necessary, and click Sensor Data Collection.
  - LabQuest® App: Choose New from the File menu.

The software will identify the sensor and load a default data-collection setup. You are now ready to collect data.

### Need Additional Information?

Visit the following link:

[www.vernier.com/start-lq-sensor](http://www.vernier.com/start-lq-sensor)

### Using the Product

Connect the sensor following the steps in the Quick Start section of this user manual.

The Surface Temperature Sensor is for use in air and water only. For temperature measurements in harsher environments that require a more durable probe, we recommend our Stainless Steel Temperature Probe (order code TMP-BTA).

### Videos

View videos related to this product at [www.vernier.com/sts-bta](http://www.vernier.com/sts-bta)

### Calibration

Calibration should not be necessary to perform a calibration when using this sensor. It is calibrated before it ships. However, if you want to calibrate the sensor, see [www.vernier.com/tit/1310](http://www.vernier.com/tit/1310)

### Specifications

Temperature range	–25 to 125°C
Maximum temperature that the sensor can tolerate without damage	150°C
Resolution	0.08°C (–25 to 0°C) 0.03°C (0 to 40°C) 0.1°C (40 to 100°C) 0.25°C (100 to 125°C)
Temperature sensor	20 kΩ NTC Thermistor
Accuracy	±0.2°C at 0°C, ±0.5°C at 100°C
Response time (time for 90% change in reading)	50 seconds (in still air) 20 seconds (in moving air)
Probe dimensions: probe length (handle plus body)	15.5 cm

### How the Sensor Works

This probe uses the 20 kΩ NTC Thermistor, which is a variable resistor. When the temperature increases, the resistance decreases non-linearly. The best-fit approximation to this nonlinear characteristic is the Steinhart-Hart equation. At 25°C, the resistance is approximately 4.3% per °C. The interface measures the resistance value,  $R$ , at a particular temperature and converts the resistance using the Steinhart-Hart equation:

$$T = [K_0 + K_1(\ln 1000R) + K_2(\ln 1000R)^3]^{-1} - 273.15$$

where  $T$  is temperature (°C),  $R$  is the measured resistance in kΩ,  $K_0 = 1.02119 \times 10^{-3}$ ,  $K_1 = 2.22468 \times 10^{-4}$ , and  $K_2 = 1.33342 \times 10^{-7}$ . Our programs perform this conversion and provide readings in °C (or other units, if you load a different calibration).

## Troubleshooting

First check that the sensor is responding: Connect the sensor and start the data-collection program. Hold the tip of the sensor in your hand to warm it and check that the temperature changes.

For additional troubleshooting and FAQs, see [www.vernier.com/til/1391](http://www.vernier.com/til/1391)

## Repair Information

If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your Surface Temperature Sensor, contact Vernier Technical Support at [support@vernier.com](mailto:support@vernier.com) or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

## Warranty

Warranty information for this product can be found on the Support tab at [www.vernier.com/sts-bta](http://www.vernier.com/sts-bta)

General warranty information can be found at [www.vernier.com/warranty](http://www.vernier.com/warranty)



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